Amiantofusus gen. nov. for *Fusus amiantus* Dall, 1889 (Mollusca: Gastropoda: Fasciolariidae) with description of a new and extensive Indo-West Pacific radiation

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ABSTRACT. In the present paper we describe the new genus *Amiantofusus* gen. nov. to accommodate the Atlantic species *Fusus amiantus* Dall, 1889. The genus belongs to Fasciolariidae and this family is confirmed as distinct from Buccinidae, based on anatomical differences. We add an Indo-West Pacific fauna of seven species described as new to science: *Amiantofusus pacificus* sp. nov. (North Fiji Basin, New Caledonia, southern Coral Sea, south West Pacific), *A. gloriabundus* sp. nov. (North Fiji Basin, Vitiaz Zone), *A. sebalis* sp. nov. (New Caledonia, Loyalty Islands, Vanuatu), *A. candoris* sp. nov. (Chesterfield Islands, Fairway), *A. maestratii* sp. nov. (New Caledonia), *A. borbonica* sp. nov. (Reunion) and *A. cartilago* sp. nov. (Mozambique Channel). In addition we add two unnamed species: *A.* species 1 (North Fiji Basin) and *A.* species 2 (Vanuatu). *Fusus thielei* Schepman, 1911 is briefly discussed, the generic placement is still uncertain.

INTRODUCTION

Recent deep-sea biodiversity exploration in the South Pacific by Institut de Recherche pour le Développement (IRD, Nouméa, formerly ORSTOM) and Muséum national d'Histoire naturelle (MNHN, Paris) has brought to light many hundreds of new or little known species of molluscs and other benthic invertebrates. As a result of these expeditions, over 400 new species of molluscs have been described from the deep waters off New Caledonia alone (see, among others, Crosnier & Bouchet 1991 and Bouchet & Marshall 2001). Also the Buccinidae and Fasciolariidae are well represented in this rich material. Results on the genus *Fusinus* from these expeditions has been presented in a paper dealing with the deeper water species of the subgenus *Chryseofusus* (Hadorn & Fraussen, 2003). The genus *Granulifusus* has been confirmed as being distinct from typical *Fusinus* and the species collected by these expeditions are presented in a second paper (Hadorn & Fraussen, 2005). The subgenus *Fusinus* is discussed in two subsequent papers (Snyder & Hadorn, 2006 and Hadorn & Fraussen, 2006).

The fusinids studied in the present paper belong to another particular group of species with a particular shape and protoconch morphology. Fasciolariidae with a peculiar protoconch with striking semilunar axial riblets has been reported from East Atlantic seamounts by Gofas (2000). This character is shared with the Indo-West Pacific Fasciolariidae presented in this paper, which are remarkably similar with the amfi-Atlantic *Fusus amiantus* Dall, 1889 in conchological characters, radula morphology and anatomy, and, consequently, are congeneric.

Amiantofusus gen. nov. has a fasciolariid radula, however the species are conchologically quite similar to Buccinidae. Therefore the anatomy of the type species, *Fusus amiantus* Dall, 1889, and one of the new Pacific species was studied. Surprisingly little is known about the anatomy of Fasciolariidae. Only a few publications (e.g. Marcus & Marcus, 1962 and Ponder, 1970) are dedicated to soft-body morphology and anatomy of this family, as well as a paper on the

stomach of Buccinoidea (Kantor, 2003), including descriptions of some fasciolariid species. In the present paper we discuss the anatomical characteristics of Fasciolariidae and Buccinidae, to confirm them as distinct and to derive a correct definition for Fasciolariidae.

The material described in the present study originates from various French research vessels and expeditions in the tropical Indo-West Pacific (e.g. Richer de Forges, 1993), conducted during the last 30 years, which are part of the still ongoing sampling program to study the tropical deep-sea benthos in the Indo-Pacific, for a better knowledge of the biodiversity:

(a) MUSORSTOM 5, CORAIL 2 and EBISCO expeditions to the Coral Sea, and especially Chesterfield-Bellona Plateau (Richer de Forges *et al*, 1986, Richer de Forges, 1990).

(b) BATHUS 1, 2 & 3, BIOCAL, HALIPRO 1, BIOGEOCAL, CHALCAL 2, SMIB 3, 4 & 8, MUSORSTOM 6, NORFOLK 1 & 2 and BERYX 11 expeditions off eastern and southern New Caledonia (Loyalty Basin) and Loyalty Ridge (Richer de Forges & Chevillon, 1996).

(c) BATHUS 4 and MUSORSTOM 4 expeditions off northern New Caledonia.

(d) MUSORSTOM 7 expedition to the Fiji Basin.

(e) VOLSMAR and MUSORSTOM 8 expeditions to Vanuatu and the New Hebrides Arc (Volcanos Hunter & Matthew) (Richer de Forges *et al*, 1996).

(f) BORDAU 2 expedition to Tonga (no published cruise report yet).

(g) TAIWAN 2000 expedition to Taiwan (no published cruise report yet).

(h) MD32 expedition off Reunion.

(i) Material recently obtained as a by-product of commercial shrimp fisheries in the Mozambique Channel off Madagascar and offered to collectors.

Material from the French expeditions is, unless otherwise stated, deposited in MNHN. The material is, unless being a type (which are allocated to catalogue numbers), unambiguously designated and retrievable by the combination of expedition acronym and station number.

Abbreviations

AMNH: American Museum of Natural History, New York, USA
AMS: Australian Museum, Sydney, Australia
EM: collection Eric Monnier, France
IRD: Institut de Recherche pour le Développement, Nouméa, New Caledonia
KF: collection Koen Fraussen, Belgium
MNHN: Muséum national d'Histoire naturelle, Paris, France
NMNZ: Museum of New Zealand *Te Papa Tongarewa*, Wellington, New Zealand
ORSTOM: Former name for IRD
RH: collection Roland Hadorn, Switzerland
USNM: National Museum of Natural History, Smithsonian Institution, Washington, USA
YIC: A. N. Severtzov Institute of Problems of evolution, Russian Academy of Sciences, Moscow, Russia
ZMA: Zoologisch Museum Amsterdam, Netherlands
alc: in alcohol collection
dd: empty shell, dead collected
juv: juvenile or subadult
lv: collected alive, animal dried
BI: chalut double perches Blake (Blake trawl)
CHG: chalut à perches (beam trawl)
CC: chalut à crevettes (otter trawl for shrimp)
CP: chalut à perches (beam trawl)
DC: drague Calypso (Calypso dredge)
DE: drague épibenthique (epibenthic dredge)
DP: petite drague à roche (small rock dredge)
DW: drague Warén (Warén dredge)
dr: dragage (dredging)
stn: station

Abbreviations on figures

aoe – anterior oesophagus
cept – cephalic tentacles
cme – cut mantle edge
ct – ctenidium
dg – digestive gland
dgL – duct of the gland of Leiblein
fpg – female pallial gonoduct
gL – gland of Leiblein
hg – hypobranchial gland
int – intestine
lsg – left salivary gland
nep – nephridium
ng – nephridial gland
nr – circumoesophageal nerve ring
op – operculum
os – osphradium
ov – ovary
p – penis
per – pericardium
poe – posterior oesophagus
pr – proboscis within rhynchodaeum
prp – propodium
prr – proboscis retractor
re – rectum
rsg – right salivary gland
s – siphon
sd – salivary duct
semd – seminal duct visible through penis wall
st – stomach
tes – testis
vd – vas deference
vL – valve of Leiblein

SYSTEMATICS

Family **FASCIOLARIIDAE** Rafinesque, 1815

Diagnosis and discussion. It is not easy to draw clear distinction between Fasciolariidae and Buccinidae, which have rather similar anatomy. Traditionally the differentiation has been made on the basis of the radula. Fasciolariidae possess the broad lateral teeth with many cusps (more than 5) and very small central and narrow tooth with 1 to several weak cusps. Buccinidae, on the contrary are usually having 2-4 cusps on the laterals and relatively much broader, subsquare central tooth with 3-4 cusps. In fact this is not that straightforward. There are some genera which have basically the fasciolariid radula type, but classified within Buccinidae. One of these genera is *Thalassoplanes* Dall, 1908. The radula was illustrated by Bouchet & Warén (1986: pl. 1, fig. 5) and it is superficially very similar to that of *Fasciolaria*. The anatomy of *Brevisiphonia circumreta* Lus, 1973 (the type species of *Thalassoplanes*) was described by Lus (1973), who attributed the genus to Fasciolariidae. Similarly, *Troschelia berniciensis* (King, 1846) has "fasciolariid-like" lateral radular teeth with 5-10 cusps (Bouchet & Warén, 1985: figs 484-485), but it was attributed by the latter authors to Buccinidae.

Although Ponder (1970) concluded, that there are no reliable anatomical differences, that readily distinguish the families of Buccinoidea; Kantor (2003) stated that stomach anatomy is similar in all Fasciolariidae examined and allows to distinguish them from other Buccinoidea in a combination of characteristics, particularly in the absence of the posterior mixing area (sometimes called as caecum), in the low relief of the folds on the inner stomach wall, in the presence of transverse striations on the low longitudinal fold, in the absence of clear differentiation of the gastric chamber into dorsal and ventral parts.

The foregut anatomy is rather uniform in all buccinoideans, and is characterized by a long proboscis, large paired or fused acinous salivary glands, a usually well developed valve and gland of Leiblein, and by the absence of accessory salivary glands. Nevertheless there are some minute differences, that seems to be important. One of them is the passage of the ducts of the salivary glands. In Buccinidae the ducts, after leaving the glands, are following freely along the anterior oesophagus towards the anterior part of the proboscis, where they enter the walls of the oesophagus close to their entrance into the buccal cavity. In Fasciolariidae to the contrary (*Leucozonia nassa*, by Marcus & Marcus, 1962), the ducts, shortly after leaving the glands, enter the anterior oesophagus walls in front of the valve of Leiblein. They follow to their openings into the buccal cavity under the lateral folds of the oesophagus. Ponder (1970) unfortunately did not write anything specific on the ducts in his description of the anatomy of *Microfulgur carinatus* Ponder, 1970.

The second characteristic are the proboscis retractor muscles. In Buccinidae the retractors are usually numerous and are attached in bundles laterally to the median to the proboscis sheath (= rhynchocoel). In Fasciolariidae there are either the single pair of the retractors, or even there can be a single powerful retractor, attached to rhynchocoel (Ponder, 1970; Marcus & Marcus, 1962 and Kantor, unpublished).

The combination of the above mentioned characteristics, that are multicuspid lateral radular teeth together with very small central tooth, single or paired proboscis retractors, salivary ducts passing within the oesophagus walls and characteristic stomach morphology seems to allow to diagnose Fasciolariidae confidentially.

It also should be specified, that only the combination of all these characteristics confirms the placement of a genus within Fasciolariidae, while single character may be present in Buccinidae as well. Thus, *Thalassoplanes* possesses a clearly fasciolariid radula, but the stomach has a very long posterior mixing area and salivary ducts which pass freely along the anterior oesophagus (Lus, 1973).

Amiantofusus gen. nov. possesses the anatomical characters, mentioned above for Fasciolariidae: position of the salivary ducts, the single or paired proboscis retractors, as well as stomach morphology, all very similar to that of other Fasciolariidae (although due to fixation we were not able to examine it in details). The combination of these characters allows us to prove the position of the genus within Fasciolariidae.

Genus ***Amiantofusus*** gen. nov.

Type species: *Fusus amiantus* Dall, 1889, amfi-atlantic (West Atlantic: northern Caribbean. East Atlantic: around Azores).

Description. Shell small to medium, white, yellowish, pale brown to orange-brown, fusiform, slender, with high spire and rather short siphonal canal.

Protoconch multispiral, pointed, with 3 - 3 1/2 whorls. First whorls smooth, glossy. Last whorl with fine but strong, semilunar, axial riblets and with 1, occasionally 2, fine suprasutural spiral cord(s).

Teleoconch whorls ornamented with spiral cords, weak or invisible in the axial interspaces, forming well developed knobs on the axial ribs. Their number increasing from 2 (occasionally 3) on the first whorl to 4-6 on penultimate whorl. Most species develop secondary spiral cords.

Aperture ovate to narrow, more or less pinched at both ends. Outer lip simple, usually thin. Columella smooth, callus thin. Outer lip and columella usually with one or more internal knobs or lirae (fully adult specimens), adapical columellar knob occasionally strong. Most specimens (subadult) without internal

knobs or lirae inside outer lip. Siphonal canal short, broad, open.
Operculum corneus, thin, pale brown, rather small, elongate, nucleus terminal.

Radula with small, narrow, tricuspid central tooth with elongate base. Lateral teeth broad, slightly curved, with 4 major cusps accompanied by a small knob or cusp at both ends.

Anatomy and operculum of *Amiantofusus amiantus* (Dall, 1889), was studied in an adult male (spire length 14.0 mm, body whorl length 8.3 mm, apertural length 5.6 mm, siphonal width 5.3 mm. Shell with 3.8 protoconch and 5.75 teleoconch whorls) from Meteor Bank (central Atlantic), SEAMOUNT 2, stn DW180.
Body light yellow (preserved), digestive gland light orange, testis slightly lighter, upper whorls were torn off by extracting the body from the shell, mantle cavity spanning slightly over 1/2 whorl. Nephridium narrow spanning about 1/5 whorl, nephridial gland narrow, with transparent walls (Fig. 6 – **ng**). Lobes of the digestive gland fuse without distinct border. The gland occupies the ventral part of the upper whorls of visceral mass, the border line between digestive gland and the testis is slightly wavy (Fig. 1).
Foot thick, with subrectangular sole, rounded posteriorly. Propodium narrow (Fig. 2 – **prp**), separated from metapodium by very narrow and shallow propodial cleft. Operculum (Fig. 1 – **op**) completely transparent, light yellow, very thin, elongate-oval, with terminal nucleus, nucleus eroded. Growth lines very thin, inconspicuous, and numerous. Operculum attached along short oval area (under 1/2 of operculum length) to opercular pad. Head medium-sized, poorly differentiated from the foot, tentacles long (Figs 2-3 – **cept**), closely spaced at the bases, conical with distinct black eyes, at tentacles bases.
Mantle cavity. Mantle cavity is in all respects similar to that of *Amiantofusus pacificus* (Fig. 9), long, its length about 1 1/2 the width, edge even and thickened when animal is contracted. Mantle wall very thin, osphradium, ctenidium, pallial gonoduct, and hypobranchial gland visible by transparency. Siphon with thick and contracted walls, short, very slightly extending beyond mantle edge. Ctenidium large, but narrow, occupying about 0.9 of mantle length, consisting of simple tall triangular lamellae. Osphradium twice as wide as ctenidium and 0.6 of its length, assymmetrical, with broad axis. Its lamellae on the right side are wider than on the left side, especially in the anterior part in proximity to the mantle edge. Hypobranchial gland indistinct, narrow, lacking folds, covered with thick mucus layer. Rectum narrow, thin-walled, of similar diameter along its length, without terminal papilla. Rectal gland absent.
Alimentary system (Figs 4-6). Proboscis medium long in contracted state (about 1.8 mm, or 0.32 aperture length), with smooth walls, occupying most of rhynchocoel length, rhynchodeum semitransparent. Proboscis narrow, length about 5.5 diameter. Mouth opening broad (Fig. 5) compared to proboscis diameter, in the shape of dorso-ventrally compressed narrow slit. Proboscis retractor large (Figs 4-5 – **prr**), unpaired, attached to the rhynchodaeum ventrally at its mid-length.
Oesophagus leaving proboscis posteriorly is broad, rounded in section and forming very long loop (Fig. 5). Valve of Leiblein large (Fig. 5 – **vL**), comparing to oesophagus diameter, pyriform, the ciliar conical valve is visible through transparency of the walls of the valve. The valve is situated anterior to proboscis tip, when the latter is retracted. Oesophagus narrow immediatcly posterior to the valve and passing through the nerve ring. Circumoesophageal nerve ring comparatively large (Fig. 5 – **nr**), concentrated, covered with thick connective-tissue layer, that is obscuring the borders between ganglia. Mid-oesophagus after passing through the nerve ring slightly widens, covered with loose connective tissue, which is obscuring the duct of the gland of Leiblein. Posterior oesophagus (posterior to the opening of the duct of the gland of Leiblein) of the same diameter along its length, thin-walled. Gland of Leiblein long (Figs 4-5 – **gL**), light yellow-brownish, tubular, uncoiled, tapering posteriorly.
Salivary glands large, situated on both sides of anterior part of rhynchodaeum and the circumoesophageal nerve ring, completely covering the latter (Figs 4-5 – **rsg, lsg**). The glands are semi-transparent, off white, judging from the external view acinous. Salivary ducts leaving the glands and fused with the walls of the oesophagus immediately anterior to the valve of Leiblein. The duct of the left salivary gland is much thicker, than that of the right gland. The ducts are visible through the oesophagus wall by transparency, as they follow anteriorly (Fig. 5 – **sd**). Accessory salivary glands absent. Stomach small (Fig. 6 – **st**), broadly U-shaped, without posterior mixing area. The outer stomach wall is covered by thin but distinct transverse folds visible by transparency. Posterior oesophagus opens into the stomach vetro-posteriorly (Fig. 6 – **poe**). Due to fixation it was impossible to study stomach anatomy.
Reproductive system. Penis is medium long (Fig. 3 – **p**), rounded in section at the base and more flattened closer to the apex, slightly narrowing towards the tip. Seminal duct is clearly visible by transparency. Seminal opening lacking papilla.

Comparison. *Amiantofusus* gen. nov. is characterized by the multispiral protoconch, with semilunar axial ribs and 1, occasionally 2, suprasutural spiral cords, in combination with strong axial sculpture and short siphonal canal.
Subadult specimens are more common than full adults. The shape of adult shells can differ considerably by a proportionally larger aperture and shorter siphonal canal.

The presence of a protoconch with peculiar semilunar axial ribs in combination with one or more suprasutural spiral cords is shared with the East Atlantic fasciolariid species "*Latirus*" *rugosissimus* (Locard, 1897) and buccinid *Antillophos* species (Indo-West Pacific and Caribbean). Some of these species are more common on seamounts (*Antillophos alabastrum* (Fraussen, 2003) and *Antillophos boucheti* (Fraussen, 2003)). For a discussion of East Atlantic seamount species with axial ribs on the protoconch (although not all semilunar) we refer to Gofas (2000).

Species of the deep-water subgenus *Fusinus* (*Chryseofusus*) Hadorn & Fraussen, 2003 have a short siphonal canal too, but differ by the smooth paucispiral protoconch, the higher number of spiral cords and by radular morphology (central tooth with broader base, lateral teeth with 4-8 cusps).

Species accommodated in the buccinid deep-water genus *Manaria* Smith, 1906 (type species *M. thurstoni* Smith, 1906 by original description, northern Indian Ocean, Buccinidae) may have a similar shape but differ by the smooth paucispiral protoconch, by a usually higher number of primary spiral cords but lower number of secondary spiral cords, by the weaker axial ribs and by radular morphology (which is buccinid, central tooth broader, lateral tooth with 2 cusps). For more details on this genus we refer to Bouchet & Warén, 1986.

Species of the turbinellid genus *Metzgeria* Norman, 1879 (new name for *Meyeria* Dunker & Metzger, 1874, type species *Lathyrus albellus* Dunker & Metzger, 1874 by monotypy, junior synonym of *Latirus albus* Jeffreys in Wyville-Thompson, 1873, northern Atlantic, Turbinellidae) differ by the presence of columellar folds and by radular morphology (lateral teeth with one cusp). *Meyeria decorata* Locard, 1897 has been assigned to Turbinellidae (Cernohorsky, 1973: 125), until Bouchet & Warén (1986: 161, 254) have recognized the species as a junior synonym of *Fusinus amiantus* (Dall, 1889).

Etymology. *Amiantofusus* gen. nov. is named after the type species: *Fusus amiantus* Dall, 1889.

Amiantofusus amiantus (Dall, 1889) comb. nov.
Figs 1-6, 14-16, 24-25

Fusus amiantus Dall, 1889: 169, pl. 15, fig. 11.

Type locality. Off Havana, Morro Light, Cuba, U.S. Coast Survey, stn 2, 23°14'00"N, 82°25'00"W, 1480 m.

Synonyms. *Fusus grimaldii* Dautzenberg & Fischer, 1896: 434, pl. 18, figs 10-11. Type locality: off Madeira, MONACO stn 213, 39°23'N, 31°25'W, 1384 m.

Fusus grimaldii var. *major* Locard, 1897: 330.

Meyeria decorata Locard, 1897: 337, pl. 16, figs 31-34. Type locality: off Madeira, TALISMAN 1883 dr 127, 38°38'N, 28°21'W, 1257 m.

Meyeria decorata var. *ecaudata* Locard, 1897: 338.

References. *Fusinus amiantus* (Dall, 1889), Bouchet & Warén, 1985: 161, figs 377-378, 386.

Fusinus amiantus (Dall, 1889), Gofas, 2000: 10, figs E-F.

Fusinus ? *amiantus* (Dall, 1889), Hadorn & Rogers, 2000: 9, figs 5-6.

Material examined. Holotype of *Fusus amiantus* Dall, 1889, in USNM 508726.

Type material of *Meyeria decorata* Locard, 1897, off Madeira, TALISMAN 1883 stn dr 127, 38°38'N, 28°21'W, 1257 m, 2 syntypes, MNHN 6765. - TALISMAN 1883 stn dr 126, 38°37'N, 28°21'W, 1258 m, 1 syntype, MNHN 6764.

TALISMAN 1883, off Azores (as *F. grimaldii*): dr 122, 1440 m, 4 lv. - dr 127, 1258 m, 10 lv, 3 dd, MNHN.

Princesse Alice (as *F. grimaldii*), dr 74, 1360 m, 1 lv (det. *F. grimaldii* by H. Fischer, coll. H. Fischer) (not figured by Tryon), MNHN. - Stn 719, 39°11'N, 32°44' 30"W, 1600 m, 1dd (coll. S.A.S. le Prince de Monaco), MNHN.

Jean Charcot-BIACORES 1971, stn BI66, 38°34'N, 28°19'W, 1225-1260 m, 1 lv [figured by Bouchet & Warén (1985: 162, figs 378, 386)], 1 dd, MNHN. - Stn DP48, 37°44'N, 29°03'W, 430-465 m, 1 lv, MNHN. - Stn CHG179, 38°05.5'N, 25°46'W, 1590-1665 m, 1 lv, MNHN.

SEAMOUNT 2, stn DW180, 30°04,10'N, 28°45,10'W, 1575 m, 1 alc (dissected for anatomy), MNHN.

Distribution. *Amiantofusus amiantus* is an amfi-Atlantic species. In the West Atlantic known from the northern Caribbean, off Cuba (Dall, 1889: 169). In the East Atlantic known, not from the continental shelf, but on the seamounts and slopes of the Azores and Madeira (Bouchet & Warén, 1985: 161) and on Meteor, Irving and Plato Bank (Gofas, 2000: 10).

Remarks. *Amiantofusus amiantus* is characterized by the fusinid shape but with short siphonal canal, in combination with a multispiral protoconch and the presence of peculiar semilunar axial ribs on the lower protoconch whorl.

Amiantofusus amiantus displays considerable variability in shape. Subadult specimens have a smaller aperture in combination with a longer siphonal canal. Adult specimens have a wider outer lip and shorter siphonal canal, the shape of the base looks more rounded. The spiral and axial sculpture is rather constant.

Fusinus bocagei (P. Fischer, 1882) differs by the protoconch (finer and lesser curved axial ribs, broader interspaces, the absence of subsutural spiral cords), the longer siphonal canal, the absence of a thick lip and the higher number of primary spiral cords (3 on the spire, up to 9 on the body whorl).

Latirus rugosissimus (Locard, 1897), an East Atlantic species with almost identical protoconch, differs considerably in teleoconch morphology.
For differences with *Amiantofusus pacificus* sp. nov. we refer to the comparison under that species.

Amiantofusus pacificus sp. nov.
Figs 7-13, 17-23, 28-30, 34-45, 66-69

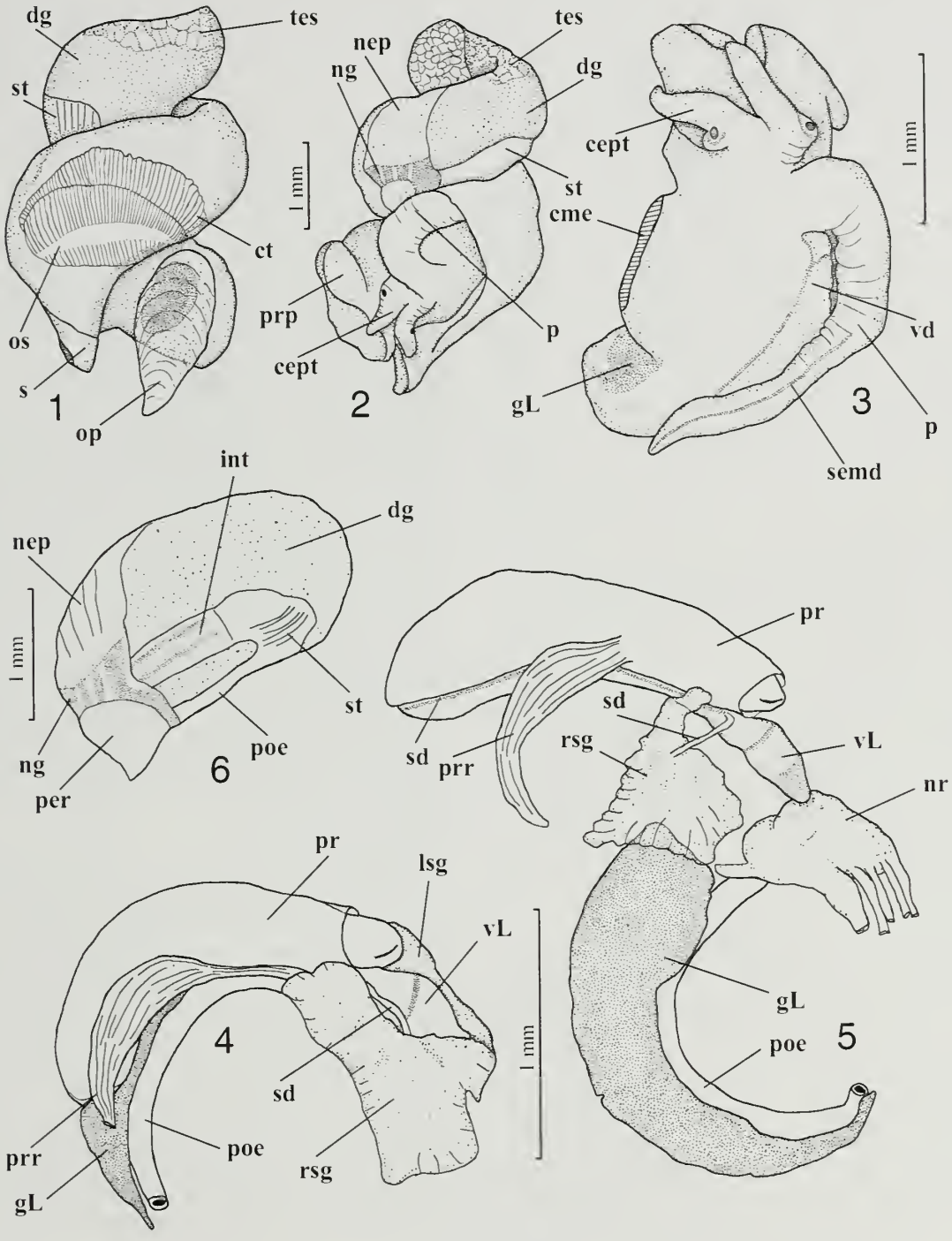
Type material. Holotype (26.3 mm) (SMIB 8, stn DW152), MNHN 7039. Paratypes 1-4 (same locality), MNHN 7064. Paratypes 5-8 (BERYX 11, stn DW10) 3 MNHN 7040, 1 YIC; Paratypes 9-10 (NORFOLK stn DW1691) 1 KF nr 5184, 1 RH.

Type locality. Norfolk Ridge, Sponge Bank, Mount B, SMIB 8, stn DW152, 24°54'S, 168°22'E, 514-530 m.

Material examined. East coast of Taiwan: TAIWAN 2000, stn DW56, 24°29'08"N, 122°12'06"E, 438 m, 1 dd.
North Fiji Basin, Vitiaz Zone: MUSORSTOM 7, stn DW539 (Combe Bank), 12°27'S, 177°27'W, 700 m, 1 dd. - Stn DW540 (Combe Bank), 12°27'S, 177°28'W, 600 m, 1 dd juv. - Stn DW573 (Waterwitch Bank), 12°31'S, 176°52'W, 364 m, 1 dd. - Stn DW576 (Waterwitch Bank), 12°31'S, 176°53'W, 680-685 m, 1 dd. - Stn DW597 (Field Bank), 12°31'S, 174°19'W, 469-475 m, 1 lv. - Stn DW625 (Bayonnaise Bank), 11°52'S, 179°34'W, 425-430 m, 2 dd, 1 lv juv. - Stn CP629 (Bayonnaise Bank), 11°54'S, 179°32'W, 400-420 m, 1 lv.
Northern New Caledonia, off Entrecasteaux Reefs: BATHUS 4, stn CP921, 18°47'S, 163°17'E, 610-613 m, 1 lv. - Stn CP922, 18°48'S, 163°19'E, 600 m, 1 dd.
MUSORSTOM 4, stn DW159, 18°46'S, 163°16'E, 585 m, 1 lv. - Stn CP199, 18°50'S, 163°14'E, 595 m, 1 dd.
Southern Coral Sea, Nova Bank: MUSORSTOM 5, stn DW313, 22°24'S, 159°33'E, 780-930 m, 2 dd (1 juv).
Southern New Caledonia, off Noumea: BATHUS 2, stn CP743, 22°36'S, 166°26'E, 713-950 m, 1 dd.
Southern New Caledonia Slope: BIOCAL, stn DW36, 23°09'S, 167°11'E, 650-680 m, 1 dd. - Stn DW51, 23°05'S, 167°45'E, 680-700 m, 1 dd, 2 lv juv.
Southern New Caledonia, Norfolk Ridge: BIOCAL, stn DW66 (Sponge Bank), 24°55'S, 168°22'E, 505-515 m, 1 lv juv, 2 dd.
CHALCAL 2, stn CC1 (Sponge Bank), 24°55'S, 168°22'E, 500 m, 1 lv. - Stn CC2 (Sponge Bank), 24°55'S, 168°21'E, 500 m, 1 dd. - Stn DW72 (Sponge Bank), 24°55'S, 168°22'E, 527 m, 3 lv, 6 dd (2 juv).
SMIB 3, stn DW2 (Sponge Bank), 24°53'S, 168°22'E, 530-537 m, 1 dd. - Stn DW3 (Sponge Bank), 24°55'S, 168°22'E, 513 m, 2 dd. - Stn DW5 (Sponge Bank), 24°55'S, 168°22'E, 502-512 m, 2 dd. - Stn DW6 (Sponge Bank), 24°56'S, 168°21'E, 505 m, 1 dd. - Stn DW7 (Sponge Bank), 24°55'S, 168°21'E, 505 m, 4 dd.
SMIB 4, stn DW34 (Sponge Bank), 24°55'S, 168°22'E, 510-515 m, 1 lv.
BERYX 11, stn DW09 (Sponge Bank), 24°52'S, 168°22'E, 635-680 m, 1 lv juv, 2 dd. - Stn DW10 (Sponge Bank), 24°53'S, 168°21'E, 565-600 m, 3 lv, 1 dd. - Stn CP60 (Aztèque Bank), 23°19'S, 168°00'E, 580-600 m, 1 lv.
BATHUS 3, stn DW807 (Jumeau West Bank), 23°40'S, 167°59'E, 420-435 m, 1 dd. - Stn DW809 (Jumeau West Bank), 23°39'S, 167°59'E, 650-730 m, 5 lv (2 juv.) (3 alc, anatomy), 8 dd (6 juv). - Stn DW810 (Jumeau West Bank), 23°40'S, 167°59'E, 850-900 m, 1 dd juv. - Stn DW824 (Aztèque Bank), 23°19'S, 168°00'E, 601-608 m, 1 lv juv, 1 dd.
SMIB 8, stn DW146-147 (Sponge Bank, Mount B), 24°55'S, 168°22'E, 508-532 m, 1 lv juv. - Stn DW149 (Sponge Bank, Mount B), 24°55'S, 168°22'E, 508-510 m, 4 dd. - Stn DW150, 24°54'S, 168°22'E, 519-530 m, 2 lv (1 juv), 3 dd (1 juv). - Stn DW152 (Sponge Bank, Mount B), 24°54'S, 168°22'E, 514-530 m, 2 lv, 8 dd (3 juv).
NORFOLK 1, stn DW1688 (Sponge Bank), 24°56'S, 168°22'E, 533-545 m, 1 lv, 2 dd (1 juv). - Stn DW1690 (Sponge Bank), 24°54'S, 168°22'E, 514-515 m, 1 dd. - Stn DW1691 (Sponge Bank), 24°54'S, 168°22'E, 509-513 m, 2 lv. - Stn DW1692 (Sponge Bank), 24°56'S, 168°21'E, 507-967 m, 3 dd (1 juv). - Stn DW1696 (Introuvable Bank), 24°39'S, 168°39'E, 780-806 m, 1 lv. - Stn DW1697 (Introuvable Bank), 24°39'S, 168°38'E, 569-616 m, 1 lv.
NORFOLK 2, stn DW2046 (Jumeau West Bank), 23°44'S, 168°01'E, 785-810 m, 1 lv juv, 1 dd juv. - Stn DW2060 (Introuvable Bank), 24°40'S, 168°38'E, 582-600 m, 3 dd. - Stn DW2065 (Athos Bank), 25°16'S, 168°56'E, 750-800 m, 1 lv, 11 dd (3 juv). - Stn DW2068 (Porthos Bank), 25°20'S, 168°57'E, 680-980 m, 7 dd (4 juv). - Stn DW2069 (Porthos Bank), 25°20'S, 168°58'E, 795-852 m, 5 lv, 16 dd (7 juv). - Stn DW2073 (Zorro Bank), 25°24'S, 168°19'E, 609 m, 1 dd juv. - Stn DW2080 (Zorro Bank), 25°20'S, 168°19'E, 764-816 m, 6 lv (3 juv), 9 dd (4 juv). - Stn DW2084 (Sponge Bank), 24°52'S, 168°22'E, 586-730 m, 4 dd. - Stn DW2086 (Sponge Bank), 24°56'S, 168°22'E, 707-777 m, 7 dd (3 juv).

Figures 1-6

1-6. *Amiantofusus amiantus* (Dall, 1889) comb. nov., Meteor Bank, SEAMOUNT 2, stn DW180, 30°04,10'N, 28°45,10'W, 1575 m, MNHN;
1-2. body; **3.** head with penis; **4-6.** alimentary system.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Southern New Caledonia, Loyalty Ridge: BIOCAL, stn DW33, 23°10'S, 167°10'E, 675-680 m, 1 lv.
BIOGEOCAL, stn CP232, 21°34'S, 166°27'E, 760-790 m, 2 dd (1 juv).
BATHUS 3, stn DW1 (Sponge Bank, Mount B), 24°56'S, 168°22'E, 520 m, 1 dd. - Stn DW7 (Sponge Bank, Mount B), 24°55'S, 168°21'E, 505 m, 1 dd. - Stn DW776 (Mount K), 24°44'S, 170°08'E, 770-830 m, 1 lv, 17 dd (12 juv). - Stn DW778 (Mount K), 24°43'S, 170°07'E, 750-760 m, 2 lv (1 juv), 4 dd (3 juv). - Stn DW780, 24°46'S, 170°07'E, 850-855 m, 1 dd juv. - Stn DW781, 23°54'S, 169°46'E (Mount J), 625-640 m, 2 dd juv. - Stn DW786, 23°54'S, 168°49'E, 699-715 m, 37 dd (19 juv). - Stn DW787, 23°54'S, 169°48'E (Mount K), 695-702 m, 1 lv, 2 dd (1 juv). - Stn DW789, 23°51'S, 169°49'E, 671-674 m, 5 dd (3 juv). - Stn DW790, 23°49'S, 169°48'E, 685-715 m, 15 lv (8 juv), 86 dd (44 juv). - Stn DW793, 23°47'S, 169°49'E, 731-751 m, 3 dd juv. - Stn DW794, 23°48'S, 169°49'E, 751-755 m, 4 lv juv, 24 dd (8 juv). - Stn DW795, 23°47'S, 169°49'E, 735-755 m, 2 dd. - Stn DW800, 23°35'S, 169°37'E (Mount D), 655 m, 1 lv juv.
MUSORSTOM 6, stn DW438, 20°23'S, 166°20'E, 780 m, 3 dd (2 juv). - Stn DW468, 21°06'S, 167°33'E, 600 m, 1 lv. - Stn DW488, 20°49'S, 167°06'E, 800 m, 1 dd.
Vanuatu Islands, Gemini Mountain: VOLSMAR, stn DW55, 20°59'S, 170°02'E, 710 m, 7 dd (6 juv).
Tonga Islands: BORDAU 2, stn DW1632, 22°01'S, 175°42'W, 613-618 m, 1 lv.

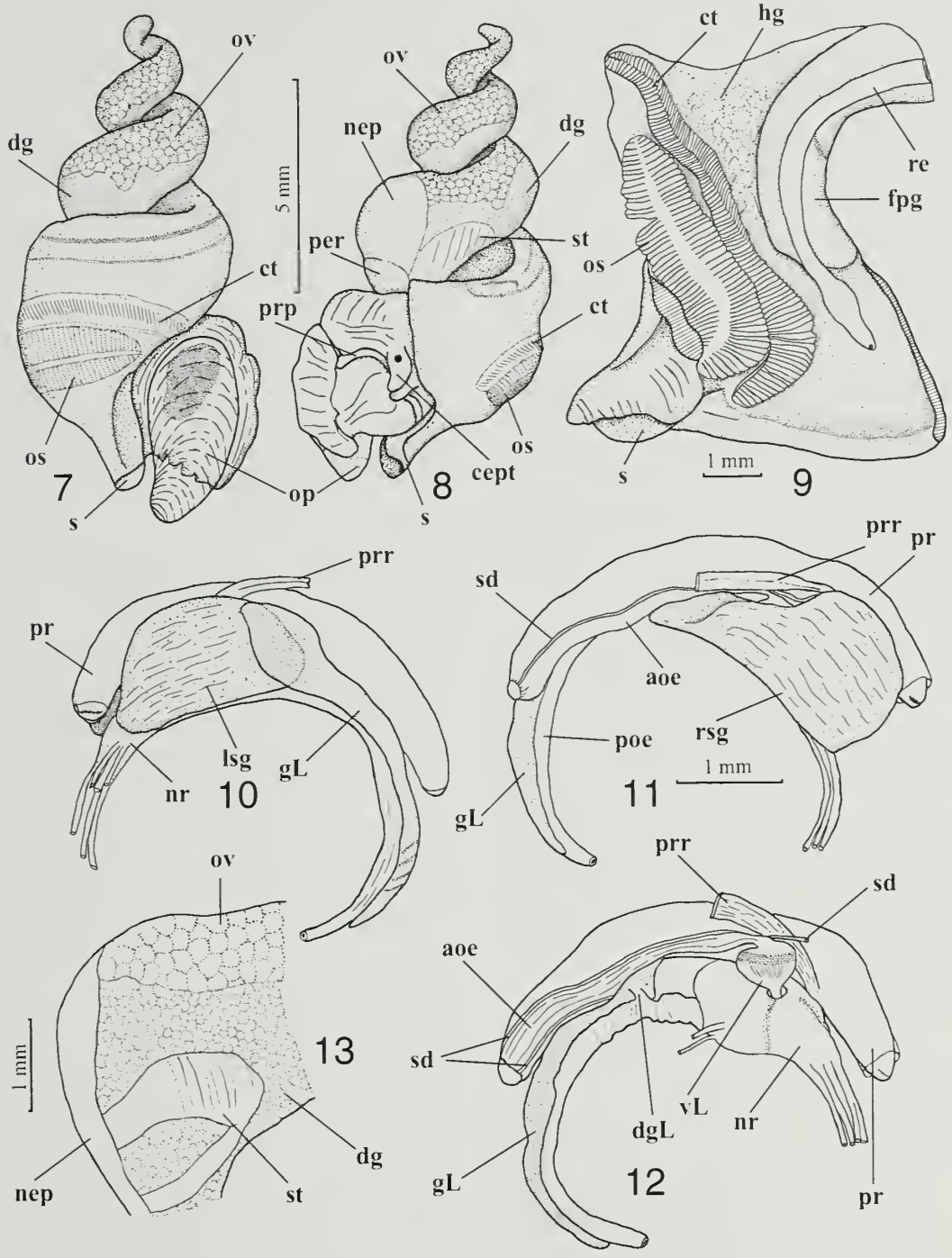
Distribution and habitat. *Amiantofusus pacificus* is known from Taiwan in the north, the Vitiaz Zone of north Fiji Basin, the Coral Sea (Nova Bank), off New Caledonia (Norfolk Ridge, Loyalty Ridge), off Vanuatu and off Tonga. Bathymetric range alive in 420-795 m, empty shells at 364-850 m.
Living on rubble bottoms. Most specimens collected alive are juvenile.

Description. Shell of medium size (about 26 mm, occasionally up to 43.6 mm), fusiform, slender with high spire and short siphonal canal. Axial sculpture dominant on all whorls. Suture rather deep. Colour ranging from white to orange.
Protoconch multispiral consisting of about 3 whorls, shape conical, colour yellow or pale orange. Diameter 0.9 mm. Tip eroded. First whorls smooth, glossy. Last 1 to 1 1/4 whorl covered with numerous axial riblets, at first fine, slightly curved, dense, gradually becoming broader, stronger and more curved at abapical end. Ornamented with suprasutural spiral cord.
Teleoconch consisting of 7 1/4 convex whorls.
First teleoconch whorl with 2 sharp primary spiral cords and 1 additional, fine, subsutural cord. Second whorl with a fourth spiral cord partly concealed under lower suture. Third whorl with 3 primary cords, adapical one finer, and 1 additional, fine, subsutural cord. Interspaces broad, ornamented with many fine, axial growth lines. Primary spiral cords gradually becoming lower, interspaces with additional fine secondary spiral cords. Penultimate whorl with 4 strong, convex primary spiral cords, interspaces with 3-5 fine secondary spiral cords, in addition 4 or 5 fine subsutural spiral cords.
Body whorl with 9 or 10 primary spiral cords, 3-5, occasionally 6, secondary spiral cords between each adapical pair of primary cords. 1-4 fine secondary spiral cords between each abapical pair of primary cords. Siphonal canal with some broad spiral cords, occasionally alternating strong and fine.
All whorls with 8 or 9 sharp axial ribs, running from suture to suture. Interspaces twice as broad.
Aperture semi-ovate. Outer lip with 8 internal lirae and thick labral varix. Columella with about 9 knobs, 5 abapical and 2 adapical ones strong. Callus thin. Siphonal canal short, broad, open.
Periostracum thin, rather velvety, grey-brown.
Radula (Figs 17, 22-23) with small, narrow, tricuspid central tooth with elongate base. Lateral teeth broad, slightly curved, with 4 major cusps accompagnied by a small knob or cusp at both ends.
Operculum (Figs 7 – **op**; 18-21) completely transparent, light yellow, very thin, elongate-oval, with terminal nucleus, nucleus eroded. Growth lines very thin, inconspicuous, and numerous. Operculum attached along short oval area (about 1/2 of operculum length) to opercular pad.

Anatomy of *A. pacificus* sp. nov., a female specimen (spire length 21.0 mm, body whorl length 12.0 mm, apertural length 10.2 mm, siphonal width 8.2 mm) from Jumeau West Bank, Loyalty Ridge (southern New Caledonia), BATHUS 3, stn DW809.
Body light yellow when preserved, consisting of about 3 1/2 whorls, mantle cavity spanning about 3/4 whorl, digestive gland about 2 whorls, ovary about 3 upper whorls (Figs 7-8). Although the body was deeply retracted into the shell, the upper 6 whorls, 3 1/4 of which are teleoconch whorls, were not occupied by the body, but filled with mucus. Nephridium (Fig. 8 – **nep**) narrow spanning about 1/5 whorl, preservation precludes studies of internal anatomy. Nephridial

Figures 7-13

7-13. *Amiantofusus pacificus* sp. nov., Jumeau West Bank, Norfolk Ridge, BATHUS 3, stn DW809, 23°39'S, 167°59'E, 650-730 m, MNHN;
7-8. body; **9.** mantle cavity; **10-13.** alimentary system.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gland narrow, with transparent walls. Lobes of the digestive gland fuse without distinct border. The gland occupies the ventral part of the upper whorls of visceral mass, the border line between digestive gland and the ovary is wavy (Figs 7-8).

Foot thick, with subrectangular sole, gradually narrowing posteriorly. Propodium narrow, separated from metapodium by narrow and shallow propodial cleft. Head small, poorly differentiated from the foot, tentacles long, but folded during fixation, conical, with distinct light-brown eyes at tentacles bases (Fig. 8 – **cept**).

Mantle cavity (Fig. 9). Mantle cavity long, its length about 1.5 the width, edge even and thickened when animal is contracted. Mantle wall thin, osphradium, ctenidium, pallial gonoduct, and hypobranchial gland visible by transparency. Siphon with thick and contracted walls, short, very slightly extending beyond mantle edge. Ctenidium (Fig. 9 – **ct**) large, but narrow, occupying about 0.9 of mantle length, consisting of simple tall triangular lamellae. Osphradium twice as wide as ctenidium and 0.6 of its length (Fig. 9 – **os**), asymmetrical, with broad axis. Its lamellae on the right side are wider than on the left side, especially in the anterior part in proximity to the mantle edge. Hypobranchial gland indistinct, narrow, lacking folds, covered with thick mucus layer (Fig. 9 – **hg**). Rectum narrow, thin-walled, of similar diameter along its length, without terminal papilla. Rectal gland absent.

Alimentary system (Figs 10-13). Proboscis long in contracted state (about 4.5 mm, or 0.44 AL), with smooth walls, occupying entire rhynchocoel length, rhynchodeum semitransparent. Proboscis narrow, length about 8 1/2 diameter. Mouth opening broad compared to proboscis diameter, in the shape of dorso-ventrally compressed narrow slit. Proboscis retractors very thin, attached to the rhynchodaeum laterally in its anterior third (Figs 10-12 – **prr**). The retractor attached to the right side of rhynchodaeum is larger, consists of single muscle, while those, attached to the left side are thinner and consists of few separate muscle fibers.

Oesophagus leaving proboscis posteriorly is broad but flattened, forming a rather long loop. Valve of Leiblein large (Fig. 12 – **vL**), compared to oesophagus diameter, pyriform, the ciliar conical valve is visible through transparency of the walls of the valve. Oesophagus narrow immediately posterior to the valve and passing through the nerve ring. Circumoesophageal nerve ring comparatively large (Fig. 12 – **nr**), concentrated, covered with thick connective-tissue layer. Mid-oesophagus after passing through the nerve ring slightly widens and received short but broad duct of the gland of Leiblein (Fig. 12 – **dgL**). Posterior esophagus (posterior to the opening of the duct of the gland of Leiblein) slightly widens, but is very thin - walled, nearly transparent. Gland of Leiblein long, colorless in preserved condition, tubular, uncoiled, tapering posteriorly, very thin-walled, semi-transparent (Figs 10-12 – **gL**).

Salivary glands very large situated on both sides of anterior part of rhynchodaeum and the circumoesophageal nerve ring, completely covering the latter (Figs 10-11 – **lsg, rsg**). Salivary ducts leaving the glands and fused with the walls of the oesophagus immediately anterior to the valve of Leiblein (Figs 11, 12 – **sd**). Accessory salivary glands absent. Stomach small, broadly U-shaped, without posterior mixing area (Fig. 13 – **st**). Posterior oesophagus opens into the stomach vetro-posteriorly. Due to fixation it was impossible to study stomach anatomy.

The two examined species, *A. amiantus* and *A. pacificus* sp. nov. are very similar to each other both in radulae and anatomy. The only difference that can be mentioned is that *A. amiantus* has clearly a single proboscis retractor, attached nearly ventrally to the rhynchodaeum, while *A. pacificus* sp. nov. has a similar retractor, but attached more laterally on the right side, while there are additional thin muscle fibers attached to the rhynchodaeum on the left side and probably also functioning as retractors.

Comparison. *Amiantofusus pacificus* sp. nov. exhibits a strong degree of, mostly geographic indicated, variability. The multispiral protoconch indicates a planktotrophic development and a wide distribution. This is reflected in the geographic range indeed (from Taiwan, via North Fiji Basin to northern and southern New Caledonia, southern Coral Sea, Vanuatu and Tonga). The bathymetric range is rather narrow (420-795 m). The populations are separated by deeper water, causing a certain geographic isolation which is well reflected by the differences in shell morphology. A number of intermediates are collected (between most of the forms), evidence that these populations are not fully separated entities. Therefore we consider them merely as a variant, calling them a form. Here we use "form" in the common used sense, instead of the correct expression for "form", which is "phenon" (Mayr & Ashlock, 1991: 20).

Form **A**, the "Norfolk Ridge form" (fig. 34-35), is rather small and usually has a slightly larger siphonal canal, the colour ranges from pale orange to bright orange.

This form lives on the southwestern part of Norfolk Ridge at 500-780 m. Empty shells between 435 and 850 m.

Form **B**, the "Loyalty Ridge form" (figs 36-37), is smaller and paler, has sharper knobs on the axial ribs, has usually a higher number of secondary spiral cords (4 or 5).

This form lives on Loyalty Ridge and has a slightly deeper bathymetric range at 680-770 m. Empty shells between 505 and 850 m.

Form **C**, the "solid form" (figs 38-39), has a slightly thicker shell, giving the specimens a solid appearance. The primary spiral cords and the axial sculpture gradually become weaker on the penultimate whorl and the body whorl has a smooth appearance. The colour is pale orange to white.
This form lives on southern New Caledonia slope and the northern part of Norfolk Ridge (where it is connected and gradually mixing with form A in the south), on the northern part of Loyalty Ridge (where it is connected and gradually mixing with form B) and in the north-western area of the range (southern Coral Sea and off Noumea). Bathymetric range 515-585 m. Empty shells between 500 and 800 m.
Form **D**, the "smooth form" (figs 40-45), has a body whorl without any axial sculpture. The specimens from northern New Caledonia (off Entrecasteaux Reef) are small, the specimens from southern New Caledonia and off Tonga usually are exceptionally large for the species. Bathymetric range 613-680 m. Empty shells between 600 and 680 m. A specimen of this form is found together with "form A" at BATHUS 3, stn DW809.
The above mentioned difference in body whorl sculpture is not sufficient to describe this shell as a distinct species.
Form **E**, the "Vitiaz form" (figs 68-69), has a thick and solid shell with big axial ribs and strong secondary spiral cords, in combination with a weaker subsutural cord. The protoconch is slightly shorter (1.0 mm high, diameter 0.9 mm), usually with many, slightly straighter axial riblets. This minute difference in protoconch morphology is not sufficient to describe this shell as a distinct species.
This form lives on the banks of the Vitiaz Zone in north Fiji Basin. The single specimen from off Taiwan (TAIWAN 2000, stn DW56) is much similar.
Form **F**, represented by a single specimen, has a slightly larger protoconch, and the primary cords appear earlier and are well visible (the third spiral cord already on the first whorl, the fourth spiral cords on the third whorl).
This specimen originates from Introuvable Bank (NORFOLK 1, stn DW1696) on the eastern part of Norfolk Ridge.
Amiantofusus amiantus comb. nov. is similar in sculpture but differs in having a higher spire and a more knobbed sculpture.
"Fusus" thielei Schepman, 1911 is similar in sculpture and may look similar to specimens from northern Fiji Basin, but differs in having a broader shape and a subsutural concavity which is slightly deeper. The spiral sculpture is slightly sharper.

Etymology. Named after the Pacific Ocean, conjuring up the contrast with the Atlantic Ocean were the type species *Amiantofusus amiantus* (Dall, 1889) is living.

Amiantofusus gloriabundus sp. nov.
Figs 46-47

Type material. Holotype (34.9 mm) (MUSORSTOM 7, stn DW598), MNHN 7063. Paratypes 1-2 (juvenile) (MUSORSTOM 7, stn DW589), MNHN 7041.

Type locality. North Fiji Basin, Vitiaz Zone. Field Bank, MUSORSTOM 7, stn DW598, 12°30'S, 174°18'W, 702-708 m.

Material examined. North Fiji Basin, Field Bank: MUSORSTOM 7, stn DW589, 12°16'S, 174°41'W, 400,m, 2 lv juv (paratypes 1-2). - Stn DW594, 12°31'S, 174°20'W, 495-505,m, 1 dd juv. - Stn DW598, 12°30'S, 174°18'W, 702-708 m, 1 dd (holotype).

Distribution and habitat. *A. gloriabundus* sp. nov. is only known from the Field Bank (Vitiaz Zone north of Fiji Basin). Alive specimens in 400 m. Empty shells in 505-702 m.
A. pacificus sp. nov. was currently not collected together with *A. gloriabundus* sp. nov., although they were found close together (MUSORSTOM 7, stn DW597, respectively stn DW594).

Description. Shell large (up to 34.9 mm), semi-transparent, fusiform, slender with high spire and short siphonal canal. White. Sculpture fine, spire with reticulate appearance.
Protoconch white, multispiral, with 3 1/3 to 3 1/2 whorls, diameter 0.9 mm. First whorls smooth, glossy. Last 1 to 1 1/3 whorl covered with numerous rather straight (or occasionally curved at abapical end) axial riblets and ornamented with suprasutural spiral cord, last 1/6 part becoming slightly narrower with stronger axial riblets.
Teleoconch consisting of 8 3/4 convex whorls (holotype).
First teleoconch whorl with 3 primary spiral cords, 2 adapical ones strong, abapical one weaker but becoming as strong as others on fourth whorl. Interspaces broad, ornamented with many fine, well pronounced axial growth lines. An additional fourth primary spiral cord appears subsuturaly from fourth whorl on. Secondary spiral cords visible from third whorl on, 1 between each pair of primary cords, their number increasing to 3 on body whorl. Body whorl with 10 primary spiral cords, 3 weak secondary spiral cords between each pair of primary, and a number of broad, flat cords on siphonal canal.
First whorls with 10 narrow axial ribs, running from suture to suture. Interspaces broad. Penultimate whorl with 17 weak axial ribs, body whorl with 20 ribs.
Aperture ovate, outer lip with thick varix, columella smooth, callus thin. Siphonal canal short.
Operculum, periostracum and radula unknown.

Comparison. *Amiantofusus gloriabundus* sp. nov. is characterized by the large semi-transparent shell with a reticulate appearance on the spire and a large number of weak axial ribs on the two last whorls.
Amiantofusus pacificus sp. nov. form E, the "Vitiaz form", which is also found at Field Bank (North Fiji Basin), differs by the more pronounced spiral sculpture with 3 primary spiral cords (instead of 4), stronger secondary spiral cords, and a lower number of axial ribs.
All other *Amiantofusus* species described in this paper differ by the lower number of axial ribs on the penultimate and body whorl.
Fusus thielei Schepman, 1911 differs in having a strongly twisted columella, a lower number of axial ribs and a longer siphonal canal.

Etymology. *Amiantofusus gloriabundus* sp. nov. is named after the Latin expression *gloriabundus* (adjective), meaning "flaunty", to express the exceptional beauty of this shell.

Amiantofusus species 1

Material examined. North Fiji Basin, eastern Vitiaz Zone: MUSORSTOM 7, stn DW635, 13°49'S, 179°56'E, 700-715 m, 1 lv.

Comparison. The single specimen is similar to *A. gloriabundus* sp. nov. in colour, spiral sculpture and by the fine incremental lines but differs by the slender shape and lower number of axial ribs.
Amiantofusus pacificus sp. nov. differs by the larger protoconch and by the primary spiral cords which are fewer in number and lesser pronounced.

Amiantofusus sebalis sp. nov.
Figs 54-57

Type material. Holotype (23.6 mm) (BATHUS 1, stn CP661), MNHN 7062. Paratypes 1-9 (same locality), 6 MNHN 7042, 1 YIC, 1 KF nr 5185 and 1 RH.

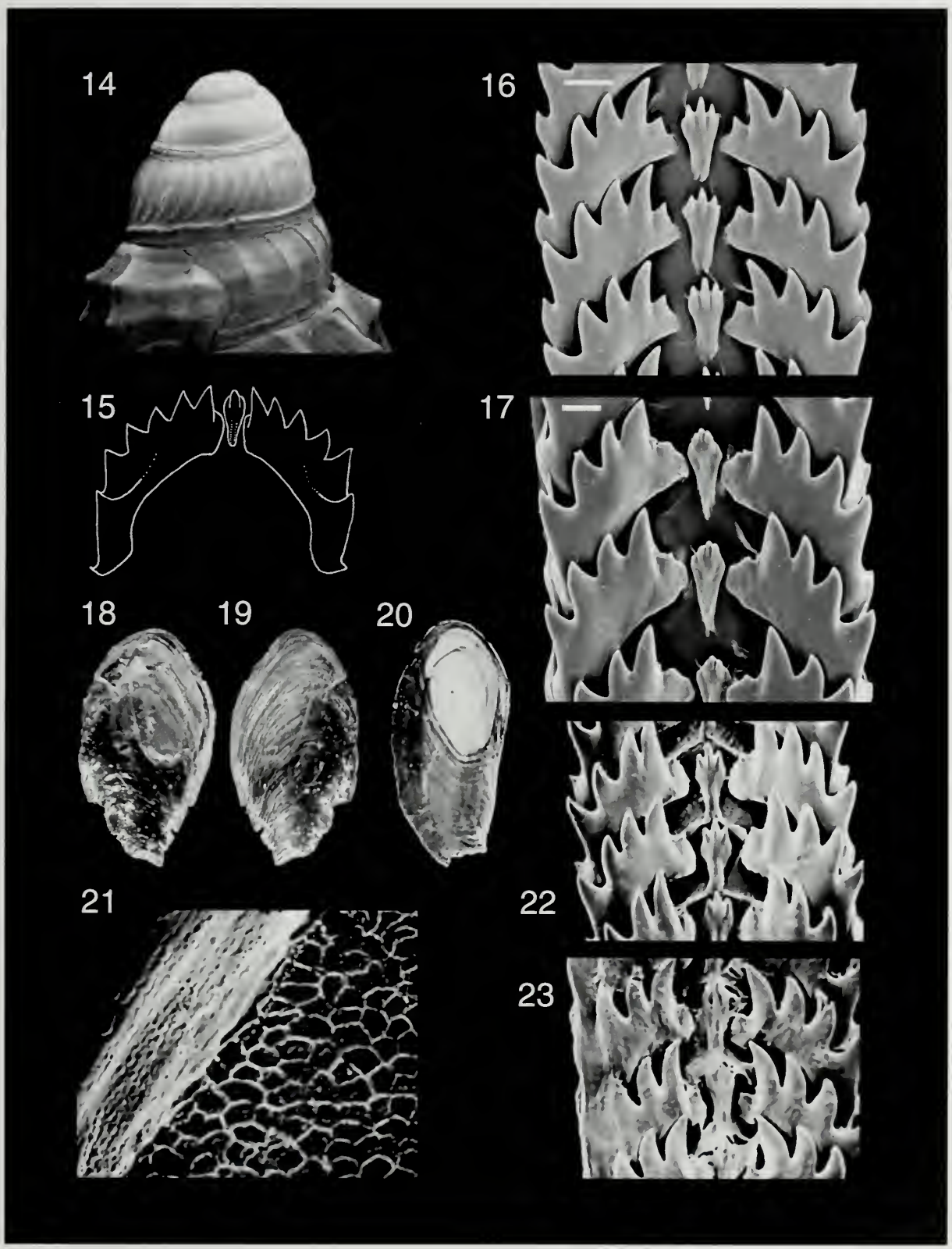
Type locality. Off eastern New Caledonia, BATHUS 1, stn CP661, 21°05'S, 165°50'E, 960-1100 m.

Material examined. Northern New Caledonia: MUSORSTOM 4, stn DW161, 18°39'S, 163°11'E, 550 m, 1 dd.
Coral Sea, Mellish Reef: CORAIL 2, stn DW172, 18°26'S, 155°12'E, 1100 m, 1 dd.
Southern Coral Sea, Nova Bank: MUSORSTOM 5, stn DW313, 22°24'S, 159°33'E, 780-930 m, 2 dd. - **Coriolis Bank:** MUSORSTOM 5, stn DC321, 22°20'S, 158°02'E, 1000 m, 12 dd. - Stn DW322, 21°29'S, 158°00'E, 975 m, 11 dd. - Stn CP323, 21°19'S, 157°58'E, 970 m, 1 dd. - Stn CP324, 21°15'S, 157°51'E, 970 m, 2 dd. - **Chesterfield Plateau**: MUSORSTOM 5, stn DW328, 20°23'S, 158°44'E, 340-355 m, 1 dd.
Eastern New Caledonia, Loyalty Basin: BATHUS 1, stn CP660, 21°11'S, 165°53'E, 786-800 m, 5 dd. - Stn CP661, 21°05'S, 165°50'E, 960-1100 m, 28 dd (5 juv) (holotype and paratypes 1-9). - HALIPRO 1, stn C858, 21°42'S, 166°41'E, 1000-1120 m, 1 dd. - BIOGEOCAL, stn CP232, 21°34'S, 166°27'E, 760-790 m, 5 dd. - BIOCAL, stn CP75, 22°19'S, 167°23'E, 825-860 m, 1 dd.
Loyalty Islands, off Ouvea: BIOCAL, stn DW80, 20°32'S, 166°48'E, 900-980 m, 1 dd, 1 lv.
Vanuatu: MUSORSTOM 8, stn CP956, 20°33'S, 169°36'E, 1175-1210 m, 1 dd. - Stn CP987, 19°23'S, 169°35'E, 1040-1050 m, 1 dd juv. - Stn CP990, 18°52'S, 168°51'E, 980-990 m, 1 dd. - Stn CP991, 18°51'S, 168°52'E, 910-936 m, 1 dd. - Stn CP1008, 18°53'S, 168°53'E, 919-1000 m, 1 dd. - Stn CP1036, 18°01'S, 168°48'E, 920-950 m, 1 dd. - Stn CP1037, 18°04'S, 168°54'E, 1058-1086 m, 1 dd.

Distribution and habitat. *Amiantofusus sebalis* sp. nov. is known from the Coral Sea (Nova Bank, Mellish Reef, Chesterfield Plateau), eastern New Caledonia (Loyalty Basin) and Vanuatu. Bathymetric range alive in 900-980 m (BIOCAL, stn DW80), empty shells in 355-1175 m.
Amiantofusus sebalis sp. nov. is syntopic with *A. maestratii* sp. nov. in Loyalty Basin (BATHUS 1, stn CP661).

Figures 14-23

14-16. *Amiantofusus amiantus* (Dall, 1889) comb. nov.
14. protoconch, 1100 micrometer, after Bouchet & Warén 1986, fig. 379; **15.** radula, 25 micrometer, after Bouchet & Warén 1986, fig. 386; **16.** radula, scale bar 10 micrometer, Meteor Bank, SEAMOUNT 2, stn DW180, 30°04,10'N, 28°45,10'W, 1575 m, MNHN.
17-23. *Amiantofusus pacificus* sp. nov.
17. radula, scale bar 10 micrometer, Jumeau West Bank, Norfolk Ridge, BATHUS 3, stn DW809, 23°39'S, 167°59'E, 650-730 m, MNHN; **18-19.** "form E", operculum, North Fiji Basin, Field Bank, MUSORSTOM 7, stn DW597, 469-475 m; **20-21.** „form D", operculum, with detail, northern New Caledonia, Entrecasteaux Reefs, BATHUS 4, stn CP921, 610-613 m; **22.** „form D", radula, same locality; **23.** „form E", radula, North Fiji Basin, Field Bank, MUSORSTOM 7, stn DW597, 469-475 m.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Description. Shell small (up to 26.4 mm, paratype 1), fusiform, slender with high spire and short siphonal canal. Shape of whorls varying from angulate (axial ribs present) to convex (no axial ribs) with weak, concave subsutural slope. White.
Protoconch multispiral, white to yellow-brown, 3 1/3 to 3 1/2 whorls. First whorls smooth, glossy. Last 1 to 1 1/4 whorl covered with numerous axial riblets and ornamented with 1 suprasutural spiral cord, last 1/4 to 1/6 part becoming slightly narrower with stronger axial riblets.
About 7 1/4 teleoconch whorls, all with 2 primary spiral cords, weak or invisible in axial interspaces, more developed on axial ribs, forming weak or strong knobs. Occasionally an additional third primary spiral cord suprasuturally visible. Secondary spiral cords weak or absent, when visible 3 or 4 between primary cords, about 8 on subsutural slope, numerous on body whorl.
First whorls with 10 or 11 axial ribs, running from suture to suture. Interspaces broad. Body whorl with 0-12 ribs.
Aperture semi-ovate, narrow, pinched at both ends. Lip thin. Columella smooth, callus thin. Siphonal canal moderately short.
Periostracum, operculum and radula unknown.

Comparison. *Amiantofusus sebalis* sp. nov. is characterized by its small size, its slender shape with 2 primary spiral cords and fine secondary spiral cords.
Amiantofusus pacificus sp. nov. differs in having a more obvious sculpture, a broader shape with shorter siphonal canal in combination with a larger adult size.
For differences with *A. maestratii* sp. nov., *A. candoris* sp. nov. and *A. borbonica* sp. nov. we refer to the comparison under these species.

Etymology. *Amiantofusus sebalis* sp. nov. is named after the Latin expression *sebalis* (adjective), meaning "made from talcum". Indeed the small shell with a rather dull surface looks rather talcose.

***Amiantofusus* species 2**
Figs 48-49

Material examined. Vanuatu: MUSORSTOM 8, stn CP1125, 15°58'S, 166°38'E, 1160-1220 m, 1 dd.

Comparison. The single specimen is similar to *A. sebalis* sp. nov. in shape and colour but differs by the slightly broader spire, the larger size (8 1/2 teleoconch whorls, 30.5 mm in length) and the more convex whorls. These weak differences are not sufficient to describe this shell before more material is available.

Amiantofusus candoris sp. nov.
Figs 62-63

Type material. Holotype (29.0 mm) (EBISCO, stn CP2648), MNHN 9962. Paratypes 1-2 (same locality), 1 MNHN 9963, 1 RH; paratype 3 (EBISCO, stn CP2652) KF.

Type locality. Chesterfield Islands, south east Fairway, EBISCO, stn CP2648, 21°32'S, 162°30'E, 458-750 m.

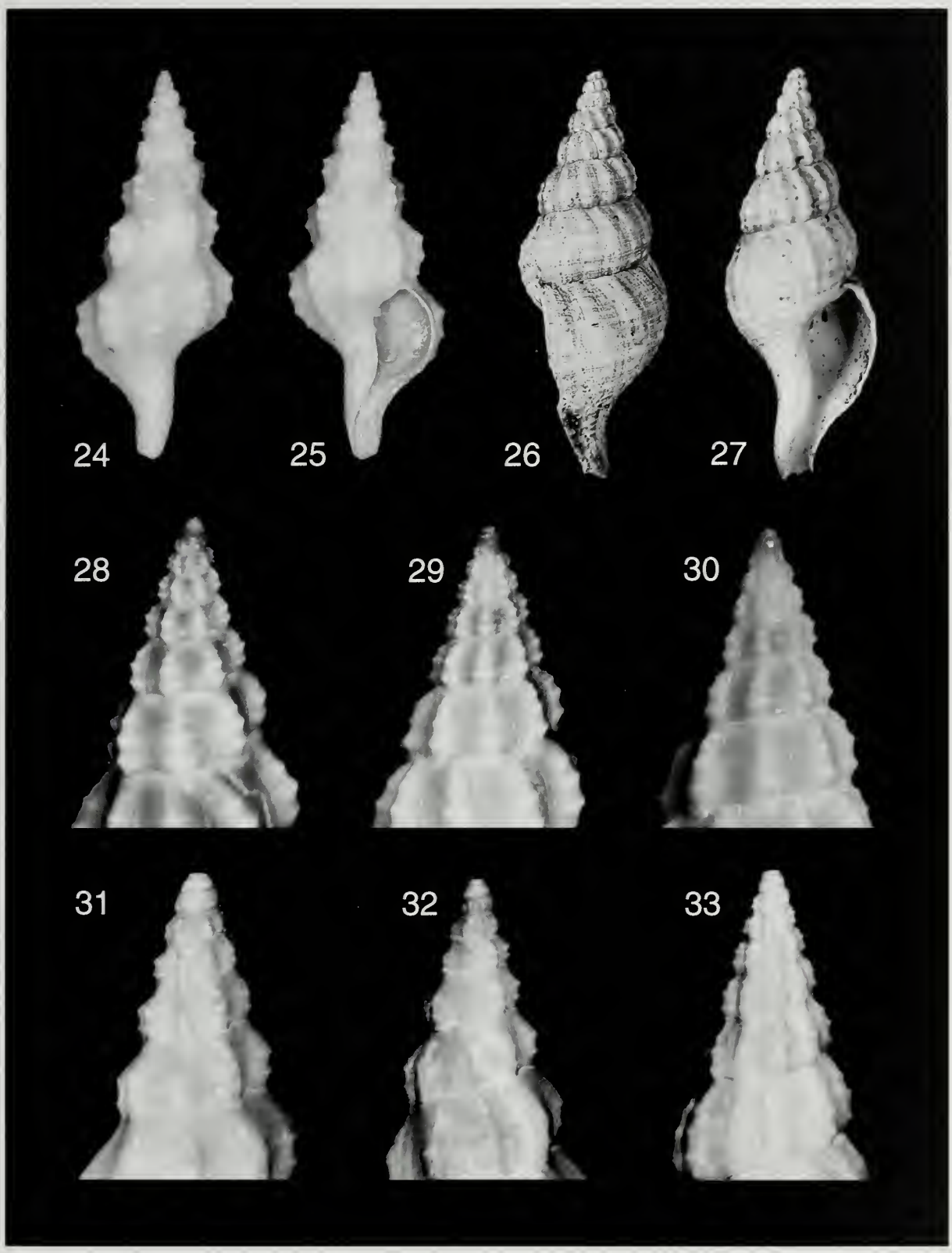
Material examined. Southern Coral Sea: Chesterfield Islands, south east Fairway, EBISCO, stn CP2648, 21°32'S, 162°30'E, 458-750 m, 3 dd (holotype and 2 paratypes). - Stn CP2652, 21°24'S, 162°37'E, 1019-1147 m, 1 dd (paratype).

Distribution and habitat. *Amiantofusus candoris* sp. nov. is known from the type material only.

Description. Shell up to 29.0 mm, white, semi-transparent, fusiform, smooth and glossy, slender with high spire and short siphonal canal.
Protoconch yellowish, top decollate in all specimens, about 2 3/4 whorls remaining, diameter 1.0 mm. Whorls eroded, numerous fine axial riblets visible on penultimate whorl. Last 1/2 whorl covered with 10 axial riblets with broad interspaces and ornamented with fine suprasutural spiral cord.

Figures 24-33

24-25. *Amiantofusus amiantus* (Dall, 1889) comb. nov., holotype, 15.6 mm, Cuba, off Havana, Morro Light, U.S. Coast Survey, stn 2, 23°14'00"N, 82°25'00"W, 1480 m, USNM 508726.
26-27. *Fusus thielei* Schepman, 1911, holotype, 46 mm, "Malaya Archipelago", ZMA.
28-30. *Amiantofusus pacificus* sp. nov.
28. protoconch of holotype, „form A", shell 26.3 mm, Norfolk Ridge, Sponge Bank, Mount B, SMIB 8, stn DW152, 24°54'S, 168°22'E, 514-530 m, MNHN 7039; **29.** protoconch of „form B", shell 21.4 mm, Loyalty Ridge, BATHUS 3, stn DW790, 685-715 m, MNHN; **30.** protoconch of "form E", shell 24.9 mm, North Fiji Basin, Field Bank, MUSORSTOM 7, stn DW597, 469-475 m, MNHN.
31-32. *Amiantofusus maestratii* sp. nov.
31. protoconch of paratype, shell 24.3 mm, eastern New Caledonia Slope, BATHUS 1, stn CP661, 960-1100 m, MNHN 7060; **32.** protoconch of holotype, shell 28.9 mm, southern New Caledonia Slope, BIOCAL, stn CP30, 1140 m, MNHN 7043.
33. *Amiantofusus cartilago* sp. nov., protoconch of holotype, 30.8 mm, Madagascar, off Morondava, 500-800 m, MNHN 7045.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Teleoconch consisting of 8 3/4 whorls. Upper spire whorls with 2 weak primary spiral cords, weak on axial ribs, almost invisible in interspaces, with broad straight subsutural slope. Abapical spiral cord becoming weaker from fourth whorl on, almost indistinguishable from secondary spiral cords on fifth or sixth whorl. Suture wavy on upper spire whorls, straight on penultimate and body whorl. From third whorl on some weak, smooth secondary spiral cords appearing between both primary spiral cords and on subsutural slope. On later whorls their number increasing up to 25, fine, evenly spaced spiral cords. Body whorl with numerous fine, weak spiral cords.
First whorls with 9 strong axial ribs, running from suture to suture. Interspaces broad. From second whorl on with 8 axial ribs. Axial ribs gradually becoming weaker near both sutures, fifth and sixth whorl with a sharp axial knob on periphery.
Aperture semi-ovate. Outer lip slightly curved outwards. Columella smooth, gently curved. Siphonal canal short, narrow.
Periostracum, radula and operculum unknown.

Comparison. *Amiantofusus candoris* sp. nov. is characterized by the slender, thin, semi-transparent shell with 2 primary spiral cords on the upper whorl of which the abapical one is gradually becoming weaker, and with fine, smooth, evenly spaced secondary spiral cords.
Amiantofusus sebalis sp. nov. is similar in spiral sculpture (2 primary cords on the upper spire whorls, many secondary cords) but differs by the secondary spiral cords which are fine and well distinguishable from the primary cords even where the primary cords are fading, the presence of axial ribs on the penultimate whorl, the (almost) smooth body whorl, the smaller protoconch with narrower last whorl and by the smaller size.
Amiantofusus maestratii sp. nov. differs in having a solid shell, a broader shape with shorter spire, smooth spiral interspaces and a white protoconch with more axial riblets.
Amiantofusus pacificus sp. nov. differs in having a more pronounced spiral sculpture in combination with a broader shape.

Etymology. *Amiantofusus candoris* sp. nov. is named after *candor* or *candoris* (Latin, masculine), meaning "heavy white colour" or "dazzling beauty" which refers to the white colour and the elegant shell.

Amiantofusus maestratii sp. nov.
Figs 31-32, 50-53

Type material. Holotype (28.9 mm) (BIOCAL, stn CP30), MNHN 7043 and 1 paratype (BATHUS 1, stn CP661), MNHN 7060.

Type locality. Southern New Caledonia Slope, BIOCAL, stn CP30, 23°09'S, 166°41'E, 1140 m.

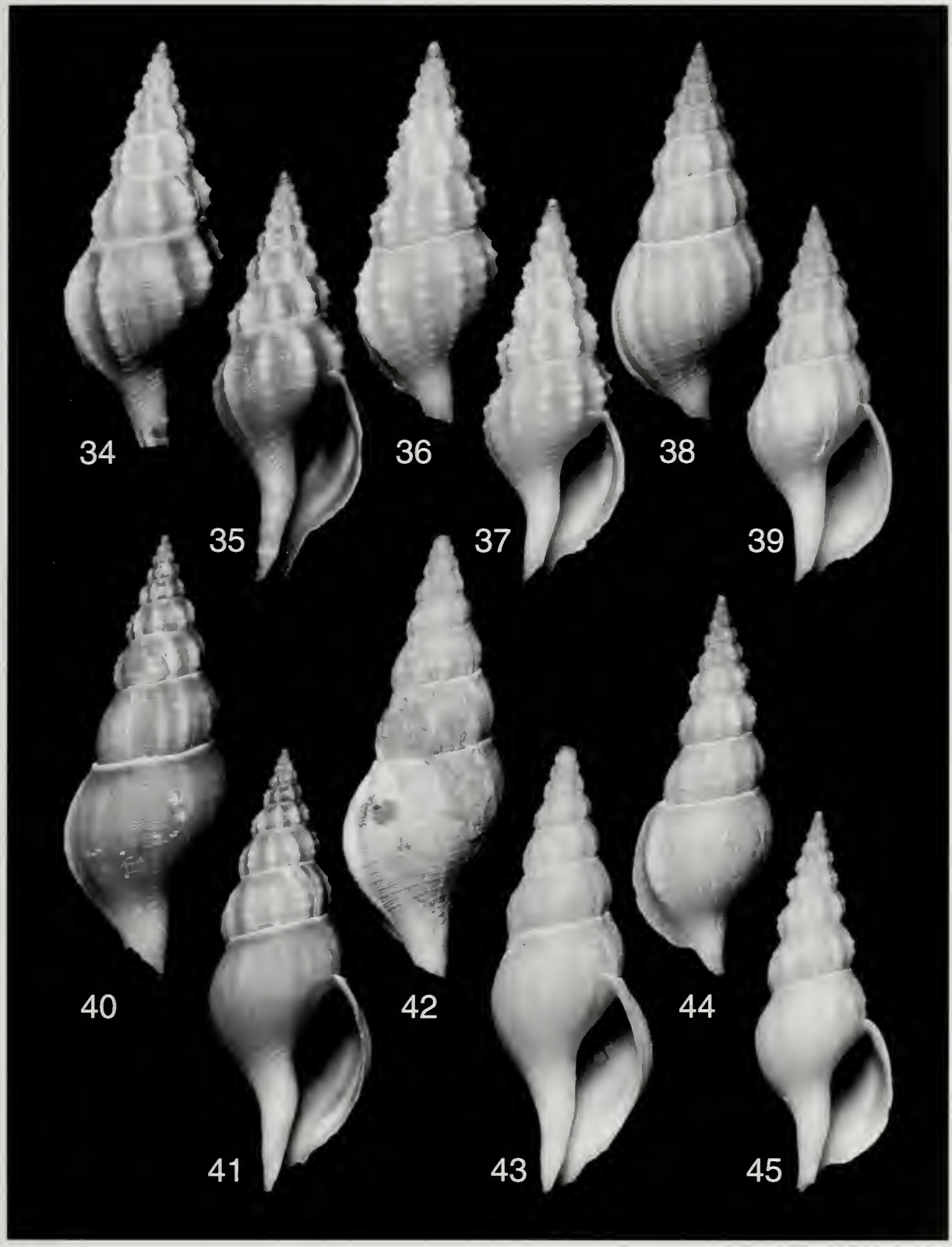
Material examined. Southern New Caledonia Slope: BIOCAL, stn CP30, 23°09'S, 166°41'E, 1140 m, 1 lv (holotype).
Eastern New Caledonia Slope, Loyalty Basin: BATHUS 1, stn CP661, 21°05'S, 165°50'E, 960-1100 m, 1 dd (paratype).

Distribution and habitat. *Amiantofusus maestratii* sp. nov. is known from the type material only. One alive specimen in 1140 m, one empty shell in 960-1100 m.
Amiantofusus maestratii sp. nov. is sympatric with *A. sebalis* sp. nov. in Loyalty Basin (BATHUS 1, stn CP661).

Description. Shell up to 28.9 mm, white to pale yellow-brown, fusiform, rather smooth and glossy, slender with high spire and short siphonal canal.
Protoconch white, top decollate in all specimens, last whorl eroded, about 3 whorls by estimation, diameter 1.2 mm. Last whorl covered with more than 20 axial riblets and ornamented with suprasutural spiral cord.
Teleoconch consisting of 7 or 8 whorls. All whorls with 2 weak primary spiral cords, weak on axial ribs, almost invisible in interspaces, with broad straight subsutural slope. Suture wavy, slightly shouldered, incision rather deep. From fourth whorl on a weak secondary spiral cord appearing between both primary spiral cords. On fifth whorl their number increasing up to 3-5 between primary cords, 2 or 3 additional secondary spiral cords between abapical cord and suture, and numerous on subsutural slope. Body whorl with numerous spiral cords, about 7 primary cords slightly stronger only.
First whorls with 10 strong axial ribs, running from suture to suture. Second whorl to body whorl with 8-10 ribs. Interspaces broad.
Aperture semi-ovate. Outer lip slightly thickened. Paratype with weak adapical columellar denticle. Siphonal canal short.
Periostracum, radula and operculum unknown.

Figures 34-45

34-45. *Amiantofusus pacificus* sp. nov.
34-35. holotype, "form A", 26.3 mm, Norfolk Ridge, Sponge Bank, Mount B, SMIB 8, stn DW152, 24°54'S, 168°22'E, 514-530 m, MNHN 7039; **36-37.** "form B", 21.4 mm, Loyalty Ridge, BATHUS 3, stn DW790, 685-715 m, MNHN; **38-39.** "form C", 28.7 mm, southern Coral Sea, Nova Bank, MUSORSTOM 5, stn DW313, 780-930 m, MNHN; **40-41.** "form D", 37.5 mm, Tonga, BORDAU 2, stn DW1632, 613-618 m, MNHN; **42-43.** "form D", 43.6 mm, southern New Caledonia slope, BIOCAL, stn DW36, 650-680 m, MNHN; **44-45.** "form D", 30.6 mm, same locality, BIOCAL, stn DW51, 680-700 m, MNHN.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Comparison. *Amiantofusus maestratii* sp. nov. is characterized by the heavy shell with 2 primary spiral cords resulting in a shape dominated by 2 rows of knobs.
Amiantofusus sebalis sp. nov. is similar in spiral sculpture (2 primary cords, many secondary cords) but differs by the smaller size, the thinner shell, the more elongate spire and the (almost) smooth body whorl.
Amiantofusus caudoris sp. nov. differs by the thin shell, the slender shape with higher spire, and the presence of secondary spiral cords.
Amiantofusus pacificus sp. nov. differs in having a more pronounced spiral sculpture in combination with a broader shape.

Etymology. *Amiantofusus maestratii* sp. nov. is named to honour Philippe Maestrati (Muséum national d'Histoire naturelle, Paris) for his contributions to malacology, for his important help while studying the material available in MNHN, and for the pleasant hours we spent on Mactan Island, Philippine Islands.

Amiantofusus borbonica sp. nov.
Figs 64-65

Type material. Holotype (12.0 mm, subadult) (MD32, stn DC10), MNHN 7044. Paratype 1-3 (same locality) MNHN 7059; Paratypes 4-5 (MD32, stn DC112) 1 KF nr 5186, 1 RH.

Type locality. Reunion, MD32, stn DC10 (off Pointe des Cascades), 21°13'S, 55°52'E, 930-980 m.

Material examined. Reunion, N/O "Marion Dufresne" MD32, stn DC10 (off Pointe des Cascades), 21°13'S, 55°52'E, 930-980 m, 7 dd juv (holotype and paratypes 1-3). - Stn DC112 (off St. Pauls Bay), 20°53'S, 55°08'E, 740-780 m, 1 dd juv, 1 lv juv (paratypes 4-5).

Distribution and habitat. *Amiantofusus borbonica* sp. nov. is known from west off Reunion (off St. Pauls Bay) and east off Reunion (off Pointe des Cascades). Empty shells in 780-930 m, one alive specimen in 740-780 m.

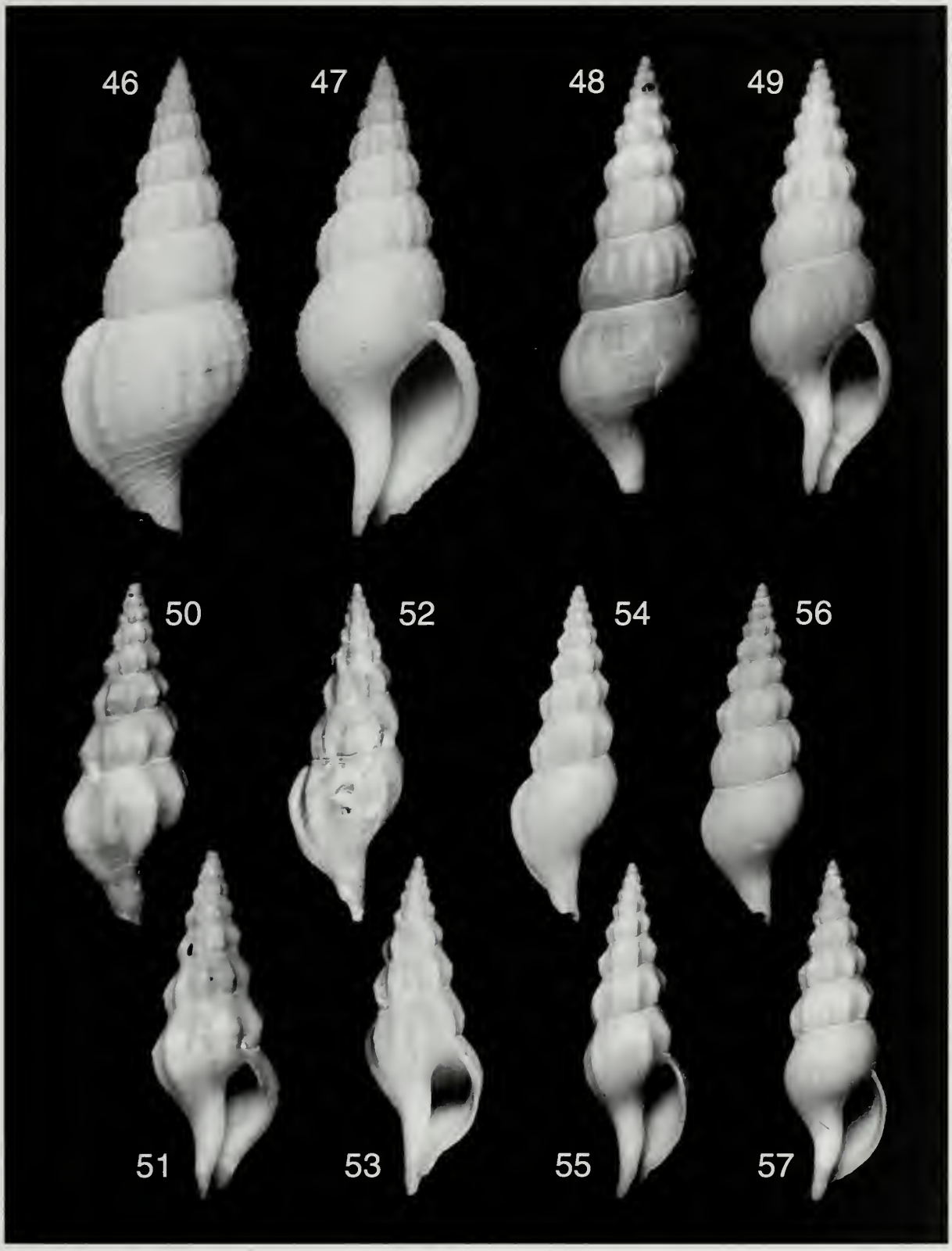
Description. Shell small (12 mm, subadult), fusiform, slender with high spire and short siphonal canal. Colour white.
Protoconch white, multispiral, 3 1/2 whorls, diameter 0.9 mm. First whorls smooth, glossy. Last 1 to 1 1/4 whorl covered with numerous axial riblets and ornamented with suprasutural spiral cord, last 1/4 to 1/6 part becoming slightly narrower with stronger axial riblets.
Teleoconch consisting of 5 1/2 whorls.
First teleoconch whorl with 2 primary spiral cords, weak in interspaces, strong on axial ribs, forming well developed knobs. From second whorl on an additional third primary spiral cord appears suprasuturally, becoming as strong as other cords from third whorl on. Occasionally a weak, hardly visible, secondary spiral cord present from third whorl on. Penultimate whorl with 3 or 4 primary spiral cords, 1-4 weak secondary spiral cords between each pair of primary cords. Body whorl with 14-16 spiral cords, of which 6 on whorl with 1 or 3 (rarely 2) secondary spiral cords, and 8-10 broad, low spiral cords on siphonal canal.
First whorls with 9-11 strong axial ribs, running from suture to suture. Interspaces broad. Body whorl with 12 or 13 axial ribs.
Aperture semi-ovate. Columella gently curved. Outer lip thin, edge sharp. Siphonal canal short.
Periostracum, radula and operculum unknown.

Comparison. Although *A. borbonica* sp. nov. is only known from subadult specimens, it is already possible to distinguish this species from *A. cartilago* sp. nov. The morphological differences in species of *Amiantofusus* are more manifest on the upper whorls. For differences with *A. cartilago* sp. nov. we refer to the comparison under that species.
Amiantofusus sebalis sp. nov. differs by the more slender shape, the presence of a subsutural concavity and the different spiral sculpture (2 primary cords only, the occasional visible third cord being suprasutural instead of being on the subsutural slope).

Etymology. *Amiantofusus borbonica* sp. nov. is named after Ile Borbon, also called Ile Bourbon, the ancient name for Reunion.

Figures 46-57

46-47. *Amiantofusus gloriabundus* sp. nov., holotype, 34.8 mm, Field Bank, MUSORSTOM 7, stn DW598, 702-708 m, MNHN 7063.
48-49. *Amiantofusus* species 2, 30.6 mm, Vanuatu, MUSORSTOM 8, stn CP1125, 1160-1220 m, MNHN.
50-53. *Amiantofusus maestratii* sp. nov.
50-51. paratype, 24.3 mm, eastern New Caledonia slope, BATHUS 1, stn CP661, 960-1100 m, MNHN 7060;
52-53. holotype, 28.9 mm, southern New Caledonia slope, BIOCAL, stn CP30, 1140 m, MNHN 7043.
54-57. *Amiantofusus sebalis* sp. nov.
54-55. holotype, 23.6 mm, eastern New Caledonia, BATHUS 1, stn CP661, 960-1100 m, MNHN 7062; **56-57.** paratype 1, 26.4 mm, smooth form, same locality, MNHN 7042.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Amiantofusus cartilago sp. nov.
Figs 33, 58-61

Type material. Holotype (30.8 mm) (Mozambique Channel), MNHN 7045. Paratypes 1-2 (same locality), KF nrs. 3462, 4063. Paratype 3, EM.

Type locality. Mozambique Channel, off Morondova, Madagascar, trawled by shrimpers, 500-800 m.

Material examined. Mozambique Channel: off Morondova, Madagascar, trawled by shrimpers, 500-800 m, 2 dd, MNHN, KF 4063 (holotype and paratype 1). - Off Majenga, Madagascar, trawled by shrimpers, 800-1000 m, 1 dd deformed, KF 3462 (paratype 2). - Off Tulear, Madagascar, 600-800 m, 1 dd, EM (paratype 3).

Distribution and habitat. Currently only known from Mozambique Channel, the type locality. All specimens are empty shells, found on white muddy sand, together with, among many others, *Fusinus retiarius* (von Martens, 1901), *F. virginiae* Hadorn & Fraussen, 2002, *F. jurgeni* Hadorn & Fraussen, 2002, *Metula crosnieri* Bouchet, 1988, *Manaria formosa* Bouchet & Warén, 1986, *Eosipho engonia* Bouchet & Warén, 1986 and *Fissidentalium metivieri* Scarabino, 1995.

Description. Shell of medium size (up to 35.6 mm), thick, solid, fusiform, slender with high spire and short siphonal canal. White.
Protoconch decollate in all studied specimens except holotype (about 1 1/3 remaining whorls), white, covered with small, rather straight axial riblets, and ornamented with suprasutural spiral cord.
Teleoconch consisting of 8 1/2 whorls.
First teleoconch whorl with 2 primary spiral cords, weak in interspaces, strong on axial ribs, forming well developed knobs, a weak subsutural cord present. Penultimate whorl with 4 primary spiral cords, 3 weak secondary spiral cords between each pair of primary cords. Body whorl with 7 or 8 primary spiral cords, each interspace with 3 or 4 secondary spiral cords, and about 12 broad, low spiral cords on siphonal canal.
First whorls with 9-11 strong axial ribs, running from suture to suture. Interspaces broad. Penultimate whorl with 10-12 axial ribs, body whorl with 9 or 10 ribs. Paratype 3 with slightly deformed shape, last whorls without axial sculpture.
Aperture semi-ovate. Columella gently curved. Outer lip thin, edge sharp. Siphonal canal short.
Periostracum, radula and operculum unknown.

Comparison. *Amiantofusus cartilago* sp. nov. is characterized by a bigger last protoconch whorl (instead of becoming narrower), a larger and solid shell, and the presence of a weak subsutural cord on the first 3 teleoconch whorls.
Buccinid species assigned to the genus *Manaria* Smith, 1906 (type species: *Manaria thurstoni* Smith, 1906, India) look rather similar to *A. cartilago* sp. nov. but differ by the spiral sculpture consisting of a higher number of primary spiral cords but a lower number of secondary cords, and by the axial sculpture consisting of stronger ribs but lesser developed knobs on the spiral cords.
Fusinus retiarius (von Martens, 1901), collected by the same vessels as *A. cartilago* sp. nov., looks similar but differs by the broader spire, the stronger spiral sculpture, and the protoconch without axial riblets.
Amiantofusus borbonica sp. nov. differs by the more narrow last protoconch whorl, the absence of the weak subsutural cord on the first 3 whorls, and the shape of the spire which is slightly broader.

Etymology. This species name is derived from *cartilago* (Latin) meaning "cartilage". The white shell with a smooth surface rather looking as made from this material.

Species with uncertain generic placement

Fusus thielei Schepman, 1911
Figs 26-27

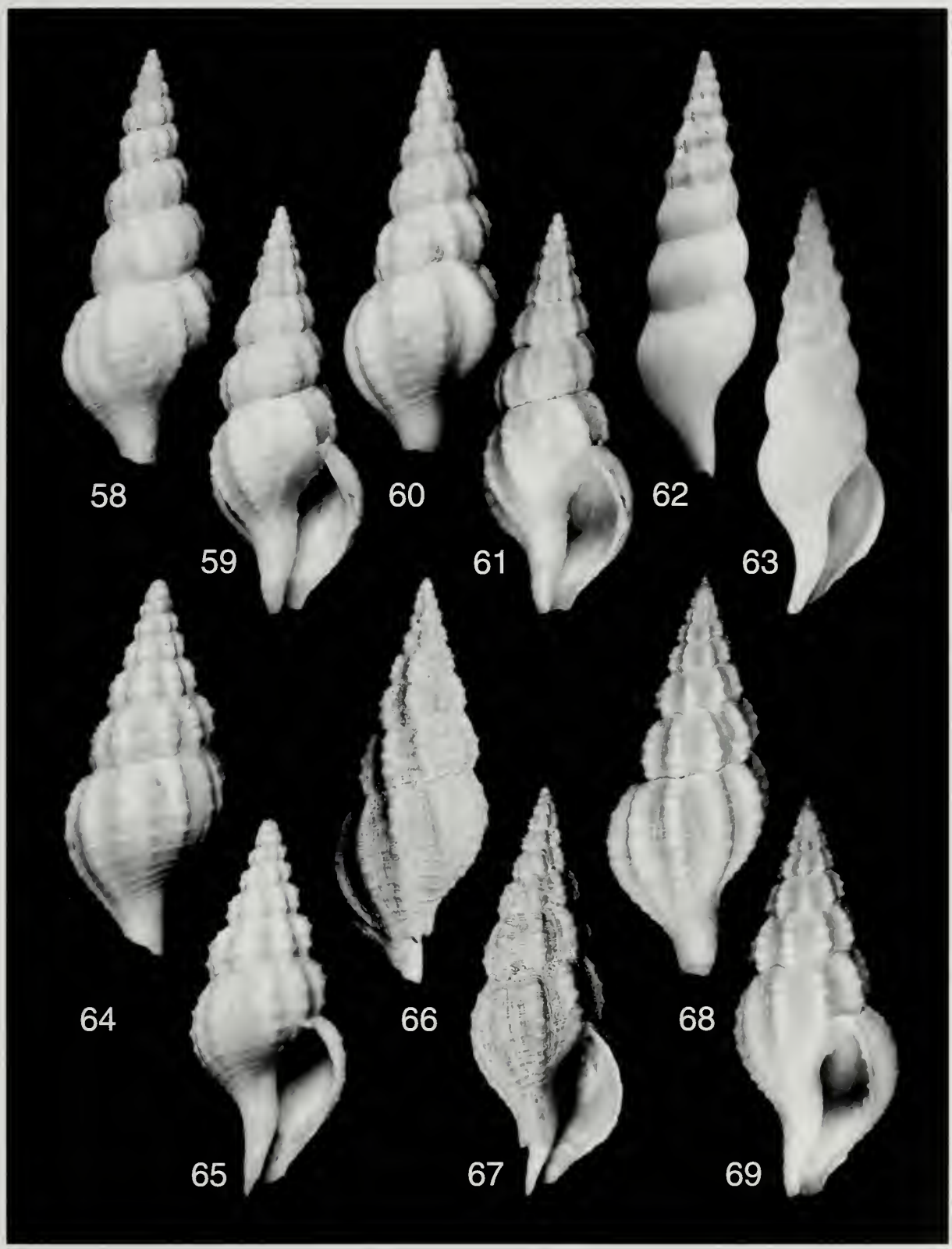
Fusus thielei Schepman, 1911: 291, pl. 19, fig. 2, type locality Timor Sea, SIBOGA, stn 300, 10°48'6''S, 123°23'1''E, 918 m, in ZMA.

Material examined. Holotype in ZMA.

North Fiji Basin, Vitiaz Zone: MUSORSTOM 7, stn DW576 (Waterwitch Bank), 12°31'S, 176°53'W, 680-685 m, 1 dd.

Figures 58-69

58-61. *Amiantofusus cartilago* sp. nov.
58-59. paratype 1, 34.5 mm, Madagascar, off Morondava, 500-800 m, KF 4063; **60-61.** holotype, 30.8 mm, same locality, MNHN 7045.
62-63. *Amiantofusus candoris* sp. nov., holotype, 29.0 mm, southern Coral Sea, Chesterfield Islands, south east Fairway, EBISCO, stn CP2648, 458-750 m, MNHN 9962.
64-65. *Amiantofusus borbonica* sp. nov., holotype, 12.0 mm, Reunion, off Pointe des Cascades, MD32, stn DC10, 930-980 m, MNHN 7044.
66-69. *Amiantofusus pacificus* sp. nov.
66-67. 21.9 mm, off eastern Taiwan, TAIWAN 2000, stn DW56, 438 m, MNHN; **68-69.** "form E", 24.9 mm, North Fiji Basin, Field Bank, MUSORSTOM 7, stn DW597, 469-475 m, MNHN.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This species is much similar to *Amiantofusus pacificus* sp. nov. but differs by having a broader shape, a slightly deeper subsutural concavity, a more twisted columella, sharp spiral cords on the base with wider and smooth interspaces. The radula differs from *Amiantofusus* by having an oval central tooth. The holotype and the specimen from North Fiji Basin are the single known specimen, but both have a decollate protoconch, consequently we cannot ascertain nor refuse the placement of this species in *Amiantofusus*.

Excluded species

Latirus rugosissimus (Locard, 1897)

Clathurella rugosissima Locard, 1897. Material from East Atlantic seamounts (Meteor, Hyères, Plato and Atlantis seamounts) assigned to *Latirus* Montfort, 1810 by Gofas (2000: 13-14). This species has a protoconch identical to *Amiantofusus* gen. nov. We follow the opinion of Gofas, based on morphological characteristics of the teleoconch sculpture.

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